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PORTLAND HARBOR RI/FS

INTERIM DELIVERABLE FOR
HUMAN HEALTH RISK ASSESSMENT:

EXPOSURE POINT CONCENTRATION CALCULATION APPROACH AND SUMMARY OF EXPOSURE FACTORS

DRAFT

December 3, 2004

Prepared for:
The Lower Willamette Group

Prepared by:
Kennedy/Jenks Consultants

1.0 Introduction

The receptors and potentially complete exposure pathways that will be evaluated
in the Baseline Human Health Risk Assessment (BHHRA) for the Portland
Harbor Superfund Site (Site) were identified in the *Programmatic Work Plan,
Appendix C: Human Health Risk Assessment Approach* (Appendix C of the Work
Plan) (Integral Consulting, Inc. et al. 2004), which was approved by the U.S.
Environmental Protection Agency (EPA) on 29 June 2004. The processes to
estimate exposure point concentrations (EPCs) and to calculate intakes were also
defined for some exposure media and pathways in Appendix C of the Work Plan.
This interim deliverable describes the process to estimate EPCs and presents
exposure factors for media and exposure pathways that were not addressed in
Appendix C of the Work Plan.

2.0 Process to Estimate Exposure Point Concentrations

EPCs will be calculated for media and pathways that will be evaluated quantitatively
in the BHHRA. The process to estimate EPCs for tissue and beach sediment was
previously described in Appendix C of the Work Plan. In-water sediment, surface
water, and groundwater seeps are the exposure media that were not addressed in
Appendix C of the Work Plan. The following sections describe the process for
deriving EPCs for these exposure media based on the sampling plans and data
evaluations currently anticipated. If the sampling plans or data evaluations change,
the process to estimate EPCs will be modified, as needed, through discussions with
EPA and its partners.

Prior to calculating EPCs for in-water sediment, surface water, or groundwater seeps,
data will be reduced, as needed, to address reporting of multiple results for the same
constituent in the same sample and to reduce laboratory duplicates and field splits of
samples to derive one value for use. Data reductions will follow the rules described
in *Guidelines for Data Reporting, Data Averaging, and Treatment of Non-Detected
Values for the Round 1 Database Technical Memorandum* (Kennedy/Jenks
Consultants et al. 2004).

Chemicals that are not detected at concentrations above the detection limit will be
designated as non-detects. Non-detects may represent concentrations that are zero, or
may represent concentrations greater than zero but less than the detection limit. For
purposes of calculating EPCs, proxy values will be assigned to non-detects in
accordance with the rules that were previously presented in Appendix C of the Work
Plan and were used in deriving EPCs for Round 1 tissue data. The following rules
will be applied to in-water sediment, surface water, and groundwater seep datasets for
a given exposure area:

- If a chemical is not detected in any sample for a given medium in a given
  exposure area, it will be assumed to not be present, so an EPC will not be
  calculated for that chemical in that medium in that exposure area

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- If a chemical is detected at least once in samples for a given medium and exposure area, a concentration equal to one-half the detection limit will be used as a proxy for non-detects in calculating the EPC for that chemical.

Some toxicity values are based on exposure to chemical mixtures and not to individual chemicals. The risks from these chemicals, which were identified in *Human Health Toxicity Values Interim Deliverable* (Kennedy/Jenks Consultants 2004), will be evaluated for the combined exposure to the chemicals and not on an individual chemical basis. For chemicals that will be evaluated as mixtures in the BHHRA, the concentrations of the individual isomers or congeners that comprise the mixtures will be summed to calculate the EPCs for the mixtures. In calculating EPCs for mixtures, the summed concentration will be calculated first on an individual sample basis. The following rules will be used to calculate the summed concentrations for a sample:

- If an individual chemical is detected in the sample, the detected concentration will be used for that chemical in the sum.

- If an individual chemical is not detected in the sample but is determined to potentially be present using the rules for non-detects, one-half the detection limit will be used for that chemical in the sum.

- If an individual chemical is not detected in the sample and is determined not to be present using the rules for non-detects, zero will be used for that chemical in the sum.

After summing the concentrations on an individual sample basis, EPCs for summed concentrations will be derived using the same process that is used for other chemicals, as described below.

2.1 IN-WATER SEDIMENT EXPOSURE POINT CONCENTRATIONS

In-water sediment data of confirmed quality collected within the Site will be used to estimate EPCs for in-water sediment. Direct contact would only occur with surface sediment, so only surface sediment data will be used in estimating the EPCs. Because the sediment sampling designs are not random, but rather are focused on potential sources, the EPCs for in-water sediment will represent conservative estimates of potential exposure. In-water sediment EPCs will be estimated for dockside workers and fishers.

For dockside workers, the exposure area is the in-water sediment adjacent to facilities with active docks. For each facility with active docks where contact with in-water sediment could occur, EPCs will be derived using surface sediment data collected adjacent to the facility between the shoreline and the navigation channel. Because the sediment sampling designs are not random, an area-weighted average (AWA)

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concentration will be calculated using the inverse distance weighting (IDW) method. The IDW method uses spatial calculations to predict chemical concentrations for locations where samples were not collected. IDW is based on the assumption that sediment concentrations close to one another are more alike than those that are farther apart. The sediment concentration is estimated for a given location by weighting the nearby measured sediment concentrations according to their distance from that location.

In accordance with EPA guidance (1989), the 95% upper confidence limit (UCL) on the AWA will be used for the EPC for the reasonable maximum exposure (RME) scenario for dockside workers. The AWA will be used for the central tendency (CT) scenario. The 95% UCLs will be calculated for each dataset following EPA guidance (EPA 2002a). ProUCL version 3.0 (EPA 2004a) will be used to test datasets for normal, lognormal, or gamma distributions and to calculate the 95% UCLs. Data will be tested first for normality, then for gamma distributions, and finally for lognormal distributions, as recommended by ProUCL guidance (EPA 2004a). The 95% UCLs will be calculated using the method recommended by ProUCL guidance (EPA 2004a) for the data distribution, sample size, and skewness.

For fishers, in-water sediment EPCs will be estimated for both short-term and long-term exposure scenarios. Short-term exposure EPCs for fishers will be used in the BHHRA to assess risks from direct contact with in-water sediment on a single occasion. As a result, the maximum detected concentrations of chemicals will be used as the short-term exposure EPCs for fishers.

Long-term exposure EPCs for fishers will be used in the BHHRA to assess risks from ongoing direct contact with in-water sediment over an entire lifetime. For repeated exposures over an entire lifetime, direct contact with in-water sediment would occur over a very wide area. As a result, the exposure areas for long-term contact are assumed to be 1 river mile, which is the smallest area over which risks from fish consumption are being evaluated, and the entire Site. For long-term contact, it is not reasonable to assume exposure to the maximum concentration (EPA 1989). Because the sampling designs are not random, the AWA concentrations will be calculated using the IDW method. The 95% UCL on the AWA will be used for the EPC for the RME scenario and the AWA will be used for the CT scenario. The AWAs and 95% UCLs will be calculated as described for the dockside worker EPCs.

2.2 SURFACE WATER EXPOSURE POINT CONCENTRATIONS

Surface water data of confirmed quality collected within the Site will be used to estimate EPCs. Near-bottom and integrated water column surface water samples will be collected at the Site. The near-bottom samples are not representative of potential human exposures to surface water, which would occur mostly at the water surface and through the water column. As a result, only integrated water column data will be

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used in estimating the surface water EPCs. Surface water EPCs will be estimated for transient and recreational beach-user exposure scenarios.

Transient exposures to surface water could occur throughout the year at transient use areas within the Site. As a result, data from all three of the currently anticipated seasonal sampling events will be used in estimating the surface water EPCs for transients. Data from the three transect stations will be used to estimate surface water EPCs for exposures at transient use areas throughout the Site. Surface water samples are also being collected at Willamette Cove, which is a transient use area, because it is a quiescent area and may not be adequately characterized by the transect samples. Data from these surface water samples will be used to estimate surface water EPCs for exposures in Willamette Cove. The other areas being sampled to support the BHHRA, Cathedral Park and Swan Island Lagoon, are not transient use areas so will not be used in estimating EPCs for transient exposures. Where data for at least five samples are available, the 95% UCL will be used for the EPC for the RME scenario. If insufficient data are available, the maximum concentration will be used for the RME scenario. The arithmetic mean will be used for the CT scenario. The 95% UCLs will be calculated as described for in-water sediment.

Recreational beach-user exposures to surface water could occur during summer months at recreational beach areas within the Site. As a result, only data from the low-water sampling event in early fall will be used in estimating the surface water EPCs for recreational beach users. Data from the three transect stations will be used to estimate surface water EPCs for exposures at non-quiescent recreational beach use areas throughout the Site. Data from surface water samples collected at Cathedral Park, Willamette Cove, and Swan Island Lagoon will be used to estimate EPCs for each of those respective recreational beach areas. Based on the current sampling design, only one sample will be collected from each quiescent area during low-water periods, so the results for the sample will be used as the EPCs for both the RME and CT scenarios for that area. Only three transect samples will be collected during low-water periods, so the maximum concentrations will be used as the EPCs for the RME scenarios and the arithmetic mean concentrations will be used as the EPCs for the CT scenarios. If additional surface water data are collected, the process to estimate EPCs will be revised, as appropriate, through discussions with EPA and its partners.

2.3 GROUNDWATER SEEP EXPOSURE POINT CONCENTRATIONS

Direct contact with groundwater would occur only within human use areas where groundwater comes to the surface (i.e., seeps) on the beach above the water line. Each groundwater seep where direct contact could occur represents an exposure area for groundwater. If groundwater seeps are sampled, the results for each seep will be used to calculate EPCs for that seep. If only one sample is collected from a seep, the results for that sample will be used as the EPCs for both the RME and CT scenarios for that seep. If more than one sample is collected from a seep, the 95% UCLs or maximum concentrations will be used as the EPCs for the RME scenarios, depending

on the number of samples collected. If data for at least five samples are available, the 95% UCLs will be calculated as described for in-water sediment. The arithmetic mean concentrations will be used as the EPCs for the CT scenarios.
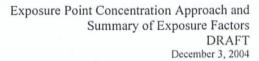
3.0 Process to Calculate Intakes

Chemical-specific intake or dose will be quantified in the BHHRA by estimating the chronic daily intake (CDI) for noncarcinogens or the lifetime average daily intake (LADI) for carcinogens. CDI and LADI, expressed in terms of the mass of substance taken into the body per unit body weight per unit time (mg/kg/day), will be calculated using equations based on exposure parameters that represent the duration of exposure, frequency of exposure, and other factors that affect overall chemical dose.

Exposure factor values and associated rationale for beach sediment, surface water, and fish consumption exposure pathways were previously presented in Appendix C of the Work Plan. These exposure factor values are summarized in Tables 1 through 17.

Receptor-specific assumptions were used to select the exposure factor values that will be used to calculate the pathway-specific chemical intakes for in-water sediment and groundwater seeps. Because default values are not available for these exposure pathways, exposure factor values were selected using best professional judgment based on knowledge of human uses of the Site. Assumptions used to select the values that will be used in the BHHRA to assess exposures to in-water sediment and groundwater seeps are described below. The exposure factor values are presented in Tables 18 through 27.

3.1 DOCKSIDE WORKERS

Dockside workers could contact in-water sediment while performing specific activities such as replacement of fender piles or maintenance dredging. Exposure factors for in-water sediment were developed for Terminal 4 based on in-depth interviews with several workers who conduct or oversee activities that could result in contact with in-water sediment. According to the Army Corps of Engineers, the Port of Portland conducts the most frequent dredging at the Site (Siipola 2004), so the exposure factors for workers at Terminal 4 are considered protective of dockside workers throughout the Site for potential in-water sediment exposures. For the RME scenario, dockside workers are assumed to contact in-water sediment for 10 years during 25 years of employment at a given facility with 10 days of sediment contact per year. For the CT scenario, dockside workers are assumed to contact in-water sediment for 4 years during 9 years of employment at a given facility. Although most maintenance dredging activities are mechanical and are unlikely to result in significant sediment contact, the dockside worker exposure factors for in-water sediment are the same as for beach sediment, which in turn are the same as default exposure factors for soil for an industrial worker.

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Dockside workers would avoid contact with groundwater seeps in beach areas. Therefore, exposure to groundwater seeps is considered an incomplete pathway for dockside workers and will not be evaluated in the BHHRA.

3.2 TRANSIENTS

Transients are unlikely to contact in-water sediment while occupying riverbank areas. Therefore, exposure to in-water sediment is considered an incomplete pathway for transients and will not be evaluated in the BHHRA.

Transients may contact groundwater seeps where groundwater discharges to transient use beaches above the water line. Chemicals in groundwater seep water could be absorbed through exposed skin. Although ingestion of seep water is unlikely, incidental ingestion theoretically could occur during activities involving significant seep contact.

Groundwater discharges above the water line are most likely to occur during low-water periods (i.e., summer months). Therefore, the exposure frequency for contact with groundwater seeps is limited to summer months. Although it is likely that most transients would avoid groundwater seeps, as a health-protective approach it is assumed that the exposure frequency and duration for transient contact with groundwater seeps is the same as for surface water during the summer months. Because transients would likely avoid groundwater seeps, the duration of contact with groundwater seeps is assumed to be 5 minutes for RME and 1 minute for CT scenarios. There are no exposure data for incidental ingestion of groundwater seep water. As a highly protective approach, the incidental ingestion of groundwater seep water is assumed to be the same as incidental ingestion of water while swimming. The exposed skin area for seep contact is assumed to be the same as the exposed skin area for beach sediment contact.

3.3 RECREATIONAL BEACH USERS

Recreational beach users could contact in-water sediment while swimming. However, any exposure to in-water sediment would be minimal and the exposure would occur under water, so it cannot be quantitatively evaluated using EPA exposure models. Therefore, exposure to in-water sediment is considered an insignificant pathway for beach users and will not be quantitatively evaluated in the BHHRA.

Recreational beach users may contact groundwater seeps where groundwater discharges to recreational beaches above the water line. Chemicals in groundwater seep water could be absorbed through exposed skin. Although ingestion of seep water is unlikely, incidental ingestion theoretically could occur during activities involving significant seep contact.

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Groundwater discharges above the water line are most likely to occur during low-water periods (i.e., summer months). Therefore, the exposure frequency for contact with groundwater seeps is limited to summer months. Although it is likely that most beach users would avoid groundwater seeps, as a health protective approach it is assumed that the exposure frequency and duration for beach-user contact with groundwater seeps is the same as for surface water. Because beach users would likely avoid groundwater seeps, the duration of contact with groundwater seeps is assumed to be 5 minutes for RME and 1 minute for CT scenarios. There are no exposure data for incidental ingestion of groundwater seep water. As a highly protective approach, the incidental ingestion of groundwater seep water is assumed to be the same as incidental ingestion of water while swimming. The exposed skin area for seep contact is assumed to be the same as the exposed skin area for beach sediment contact.

3.4 FISHERS

Fishers could theoretically contact in-water sediment on anchors, hooks, or crayfish pots while fishing from boats or piers at the Site. Both short-term and long-term exposures will be assessed. The short-term exposure scenario will evaluate contact with in-water sediment that might occur over a brief period, whereas the long-term exposure scenario will evaluate contact with in-water sediment that might occur from repeated exposures over a lifetime.

For short-term exposures, it is assumed that 1 month represents a conservative estimate of the length of time a fisher would be exposed repeatedly to a single sediment location. For each fisher scenario, the exposure frequency for beach sediment in days per week was multiplied by 4 weeks (i.e., 1 month) to determine the number of days per year that short-term exposures to in-water sediment might occur.

For long-term exposures, the exposure frequencies and durations for beach sediment for each fisher scenario were used to represent the fishing frequency at the Site. In contrast to beach sediment, a fisher is unlikely to have significant contact with in-water sediment every time fishing occurs, especially given the number of days and length of time over which exposures are assessed. A sediment contact frequency factor was used to represent the percent of fishing events that result in significant contact with sediment. It was assumed that 10% of all fishing events over an entire lifetime would result in significant contact with sediment.

The ingestion and dermal intake factors are assumed to be the same for short-term and long-term exposures. Based on the exposure scenarios for in-water sediment (i.e., contact with sediment on anchors, hooks, or crayfish pots), the extent of contact with in-water sediment would be significantly less than what would occur with soil. Ingestion rates for soil are based on exposure to soil during yard work and to indoor dust (EPA 1997). These ingestion rates are not applicable to the in-water sediment exposure scenarios; however, incidental ingestion rates are not available for sediment.

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It is assumed that the incidental ingestion rate for in-water sediment is 10% of the ingestion rate for residential soil scenarios. For dermal contact, hands are the only body parts that could be exposed to in-water sediment on a regular basis. It is assumed that the entire surface area of both hands would be exposed to in-water sediment. The adherence and absorption factors are assumed to be the same as those for beach sediment.

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Table 1

Initial Values for Daily Intake Calculations – Dockside Worker Beach Sediment Exposures

Scenario Timeframe: Current/Future
Medium: Sediment
Receptor Population: Dockside Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	50	Best professional judgment. Equivalent to 1 day per week with direct sediment contact during 250 days/year at facility, which is recommended for occupational exposure (EPA 1991)	44	Best professional judgment. Equivalent to 1 day per week with direct sediment contact during 219 days/year at facility, which is recommended for occupational exposure (EPA 1991)	
	ED	Exposure duration	years	25	Recommended value for occupational exposures (EPA 1991)	9	Recommended value for occupational exposures (EPA 1991)	
	SIR	Sediment ingestion rate	mg/day	200	Recommended value for occupational exposures (EPA 2000)	50	Recommended value for occupational exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	9,125	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	50	Best professional judgment. Equivalent to 1 day per week with direct sediment contact during 250 days/year at facility, which is recommended for occupational exposure (EPA 1991)	44	Best professional judgment. Equivalent to 1 day per week with direct sediment contact during 219 days/year at facility, which is recommended for occupational exposure (EPA 1991)	
	ED	Exposure duration	years	25	Recommended value for occupational exposures (EPA 1991)	9	Recommended value for occupational exposures (EPA 1991)	
	SA	Skin surface area	cm2	3,300	Recommended value for adult industrial scenario (EPA 2004b)	3,300	Recommended value for adult industrial scenario (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.2	Recommended value for adult industrial scenario (EPA 2004b)	0.02	Recommended value for adult industrial scenario (EPA 2004b)	
	ABS	Absorption factor	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	9,125	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 2

Initial Values for Daily Intake Calculations – Transient Beach Sediment Exposures

Scenario Timeframe: Current/Future

Medium: Sediment

Receptor Population: Transients

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	365	Best professional judgment. Equivalent to every day during the entire year.	183	Best professional judgment. Equivalent to every day for half the year.	
	ED	Exposure duration	years	2	Best professional judgment	1	Best professional judgment	
	SIR	Sediment ingestion rate	mg/day	200	Required by EPA Region 10	50	Recommended value for residential adult exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	730	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	365	Best professional judgment. Equivalent to every day during the entire year.	183	Best professional judgment. Equivalent to every day for half the year.	
	ED	Exposure duration	years	2	Best professional judgment	1	Best professional judgment	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	730	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 3

Initial Values for Daily Intake Calculations – Transient Surface Water Exposures

| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Receptor Population: Transients |
| Receptor Age: Adult |

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, surface water	mg/L	TBD	--	TBD	--	Daily Intake (CDI) (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x WIR x EF x ED x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	365	Best professional judgment. Equivalent to every day during the entire year.	183	Best professional judgment. Equivalent to every day for half the year.	
	ED	Exposure duration	years	2	Best professional judgment	1	Best professional judgment	
	WIR	Water ingestion rate	L/day	2	Recommended value for residential ingestion of drinking water (EPA 1989)	1.4	Recommended value for residential ingestion of drinking water (EPA 1989)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	730	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
Dermal	DA	Absorbed dose per event	mg/cm2-event	TBD	Chemical-specific	TBD	Chemical-specific	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	DA x SA x EF x ED x 1/BW x 1/AT
	t_{ev}	Event duration	hr/event	0.25	Best professional judgment for bathing in river. Equivalent to 15 minutes per bathing event (same as the CT value for residential showering/bathing (EPA 2004b))	0.16	Best professional judgment for bathing in river. Equivalent to 9 minutes per bathing event.	
	EF	Exposure frequency	events/yr	104	Best professional judgment (assumes 2 days per week during entire year)	52	Best professional judgment (assumes 2 days per week during half the year)	
	ED	Exposure duration	years	2	Best professional judgment	1	Best professional judgment	
	SA	Skin surface area	cm2	18,000	Recommended for adults while showering/bathing (EPA 2004b)	18,000	Recommended for adults while showering/bathing (EPA 2004b)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	730	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	

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Table 4

Initial Values for Daily Intake Calculations – Adult Recreational Beach User Beach Sediment Exposures

Scenario Timeframe: Current/Future
Medium: Sediment
Receptor Population: Recreational Beach User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	94	Best professional judgment. 5 days per week during summer (13 weeks), 1 day per week during spring/fall (26 weeks), 1 day per month during winter (3 months)	38	Best professional judgment. 2 days per week during summer (13 weeks), 2 days per month during spring/fall (6 months)	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SIR	Sediment ingestion rate	mg/day	100	Recommended value for residential adult exposures (EPA 2000)	50	Recommended value for residential adult exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	94	Best professional judgment. 5 days per week during summer (13 weeks), 1 day per week during spring/fall (26 weeks), 1 day per month during winter (3 months)	38	Best professional judgment. 2 days per week during summer (13 weeks), 2 days per month during spring/fall (6 months)	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 5

Initial Values for Daily Intake Calculations – Adult Recreational Beach User Surface Water Exposures

Scenario Timeframe: Current/Future

Medium: Surface Water

Receptor Population: Recreational Beach User

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, surface water	mg/L	TBD	--	TBD	--	Daily Intake (CDI) (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x WIR x t_{ev} x EF x ED x CF x
	t_{ev}	Event duration	hr/event	1	Best professional judgment	0.5	Best professional judgment. 1 day per week	1/BW x 1/AT
	EF	Exposure frequency	events/yr	26	Best professional judgment. 2 days per week during summer (13 weeks)	13	during summer (13 weeks)	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	WIR	Water ingestion rate	mL/hour	50	Recommended value for ingestion while swimming (EPA 1989)	50	Recommended value for ingestion while swimming (EPA 1989)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion factor	L/mL	1.E-03	--	1.E-03	--	
Dermal	DA	Absorbed dose per event	mg/cm2-event	TBD	Chemical-specific	TBD	Chemical-specific	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	DA x SA x EF x ED x 1/BW x 1/AT
	t_{ev}	Event duration	hr/event	1	Best professional judgment	0.5	Best professional judgment	
	EF	Exposure frequency	events/yr	26	Best professional judgment. 2 days per week during summer (13 weeks)	13	Best professional judgment. 1 day per week during summer (13 weeks)	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SA	Skin surface area	cm2	18,000	Recommended for adults while swimming (EPA 2004b)	18,000	Recommended for adults while swimming (EPA 2004b)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	

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Table 6

Initial Values for Daily Intake Calculations – Child Recreational Beach User Beach Sediment Exposures

Scenario Timeframe: Current/Future
Medium: Sediment
Receptor Population: Recreational Beach User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	94	Best professional judgment. 5 days per week during summer (13 weeks), 1 day per week during spring/fall (26 weeks), 1 day per month during winter (3 months)	38	Best professional judgment. 2 days per week during summer (13 weeks), 2 days per month during spring/fall (6 months)	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	SIR	Sediment ingestion rate	mg/day	200	Recommended value for residential child exposures (EPA 2000)	100	Recommended value for residential child exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	EPC x SA x AF x ABS x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	94	Best professional judgment. 5 days per week during summer (13 weeks), 1 day per week during spring/fall (26 weeks), 1 day per month during winter (3 months)	38	Best professional judgment. 2 days per week during summer (13 weeks), 2 days per month during spring/fall (6 months)	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	SA	Skin surface area	cm2	2,800	Recommended value for residential children (EPA 2004b)	2,800	Recommended value for residential children (EPA 2004b)	
	AF	Adherence factor	mg/cm2	3.3	Value for children playing in wet soil (EPA 2004b)	0.2	Value for children playing in wet soil (same as recommended RME for residential children) (EPA 2004b)	
	ABS	Absorption factor	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 7

Initial Values for Daily Intake Calculations – Child Recreational Beach User Surface Water Exposures

Scenario Timeframe: Current/Future
Medium: Surface Water
Receptor Population: Recreational Beach User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, surface water	mg/L	TBD	--	TBD	--	Daily Intake (CDI) (mg/kg-day) =
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	$EPC \times WIR \times t_{ev} \times EF \times ED \times CF \times$
	t_{ev}	Event duration	hr/event	1	Best professional judgment	0.5	Best professional judgment	$1/BW \times 1/AT$
	EF	Exposure frequency	events/yr	65	Best professional judgment. 5 days per week during summer (13 weeks)	26	Best professional judgment. 2 days per week during summer (13 weeks)	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	WIR	Water ingestion rate	mL/hour	50	Recommended value for ingestion while swimming (EPA 1989)	50	Recommended value for ingestion while swimming (EPA 1989)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	
	CF	Conversion factor	L/mL	1.E-03	--	1.E-03	--	
Dermal	DA	Absorbed dose per event	mg/cm2-event	TBD	Chemical-specific	TBD	Chemical-specific	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	$DA \times SA \times EF \times ED \times 1/BW \times 1/AT$
	t_{ev}	Event duration	hr/event	1	Best professional judgment	0.5	Best professional judgment	
	EF	Exposure frequency	events/yr	65	Best professional judgment. 5 days per week during summer (13 weeks)	26	Best professional judgment. 2 days per week during summer (13 weeks)	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	SA	Skin surface area	cm2	6,600	Recommended for children while swimming (EPA 2004b)	6,600	Recommended for children while swimming (EPA 2004b)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	

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Table 8

Initial Values for Daily Intake Calculations – Adult Recreational Fisher Beach Sediment Exposures

Scenario Timeframe: Current/Future
Medium: Sediment
Receptor Population: Recreational Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x
	EF	Exposure frequency	days/yr	156	Required by EPA Region 10. 3 days per week for entire year.	52	Required by EPA Region 10. 1 day per week for entire year.	1/BW x 1/AT
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SIR	Sediment ingestion rate	mg/day	100	Recommended value for residential adult exposures (EPA 2000)	50	Recommended value for residential adult exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x
	EF	Exposure frequency	days/yr	156	Required by EPA Region 10. 3 days per week for entire year.	52	Required by EPA Region 10. 1 day per week for entire year.	ED x CF x 1/BW x 1/AT
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 9

Initial Values for Daily Intake Calculations – Adult Native American Consumption Fisher Beach Sediment Exposures

Scenario Timeframe: Current/Future
Medium: Sediment
Receptor Population: Native American Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	260	Required by EPA Region 10. 5 days per week for entire year.	104	Required by EPA Region 10. 2 days per week for entire year.	
	ED	Exposure duration	years	70	Conventional lifetime (EPA 1989)	30	95th percentile for time at one residence (same as recommended RME for residential adults) (EPA 1997)	
	SIR	Sediment ingestion rate	mg/day	100	Recommended value for residential adult exposures (EPA 2000)	50	Recommended value for residential adult exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	25,550	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	260	Required by EPA Region 10. 5 days per week for entire year.	104	Required by EPA Region 10. 2 days per week for entire year.	
	ED	Exposure duration	years	70	Conventional lifetime (EPA 1989)	30	95th percentile for time at one residence (same as recommended RME for residential adults) (EPA 1997)	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	25,550	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 10

Initial Values for Daily Intake Calculations – Adult Non-tribal High Consumption Fisher Beach Sediment Exposures

Scenario Timeframe: Current/Future
Medium: Sediment
Receptor Population: Non-tribal Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	104	Best professional judgment. 2 days per week for entire year	26	Best professional judgment. 1 day every other week for entire year	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SIR	Sediment ingestion rate	mg/day	100	Recommended value for residential adult exposures (EPA 2000)	50	Recommended value for residential adult exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x
	EF	Exposure frequency	days/yr	104	2 days per week for entire year	26	1 day every other week for entire year	1/BW x 1/AT
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06		1.E-06		

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Table 11

Initial Values for Daily Intake Calculations – Adult Native American Fish Consumption

Scenario Timeframe: Current/Future

Medium: Fish

Receptor Population: Native American Fisher

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPCsa	Exposure point concentration, salmon	mg/kg	TBD	--	Daily Intake (mg/kg-day) =
	EPCla	Exposure point concentration, lamprey	mg/kg	TBD	--	[(EPCsa*IRsa)+(EPCla*IRla)+(EPCst*IRst)+
	EPCst	Exposure point concentration, sturgeon	mg/kg	TBD	--	(EPCbc*IRbc)+(EPCbb*IRbb)+(EPCcp*IRcp)+
	EPCbc	Exposure point concentration, black crappie	mg/kg	TBD	--	(EPCsm*IRsm)] x EF x ED x CF x 1/BW x 1/AT
	EPCbb	Exposure point concentration, brown bullhead	mg/kg	TBD	--	
	EPCcp	Exposure point concentration, carp	mg/kg	TBD	--	
	EPCsm	Exposure point concentration, smallmouth bass	mg/kg	TBD	--	
	IRsa	Ingestion rate, salmon	g/day	67	CRITFC 1994	
	IRla	Ingestion rate, lamprey	g/day	12.3	CRITFC 1994	
	IRst	Ingestion rate, sturgeon	g/day	8.6	CRITFC 1994	
	IRbc	Ingestion rate, black crappie	g/day	21.7	Ingestion rates for species that are not salmon, lamprey, or sturgeon, 86.9 g/day, divided by 4	
	IRbb	Ingestion rate, brown bullhead	g/day	21.7	Ingestion rates for species that are not salmon, lamprey, or sturgeon, 86.9 g/day, divided by 4	
	IRcp	Ingestion rate, carp	g/day	21.7	Ingestion rates for species that are not salmon, lamprey, or sturgeon, 86.9 g/day, divided by 4	
	IRsm	Ingestion rate, smallmouth bass	g/day	21.7	Ingestion rates for species that are not salmon, lamprey, or sturgeon, 86.9 g/day, divided by 4	
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates	
	ED	Exposure duration	years	70	Conventional lifetime (EPA 1989)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	25,550	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	

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Table 12

Initial Values for Daily Intake Calculations – Child Native American Fish Consumption

Scenario Timeframe: Current/Future

Medium: Fish

Receptor Population: Native American Fisher

Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPCsa	Exposure point concentration, salmon	mg/kg	TBD	--	Daily Intake (mg/kg-day) =
	EPCla	Exposure point concentration, lamprey	mg/kg	TBD	--	[(EPCsa*IRsa)+(EPCla*IRla)+(EPCst*IRst)+
	EPCst	Exposure point concentration, sturgeon	mg/kg	TBD	--	(EPCbc*IRbc)+(EPCbb*IRbb)+(EPCcp*IRcp)+
	EPCbc	Exposure point concentration, black crappie	mg/kg	TBD	--	(EPCsm*IRsm)] x EF x ED x CF x 1/BW x 1/AT
	EPCbb	Exposure point concentration, brown bullhead	mg/kg	TBD	--	
	EPCcp	Exposure point concentration, carp	mg/kg	TBD	--	
	EPCsm	Exposure point concentration, smallmouth bass	mg/kg	TBD	--	
	IRsa	Ingestion rate, salmon	g/day	27.9	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	IRla	Ingestion rate, lamprey	g/day	5.1	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	IRst	Ingestion rate, sturgeon	g/day	3.6	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	IRbc	Ingestion rate, black crappie	g/day	9.1	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	IRbb	Ingestion rate, brown bullhead	g/day	9.1	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	IRcp	Ingestion rate, carp	g/day	9.1	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	IRsm	Ingestion rate, smallmouth bass	g/day	9.1	Same dietary percentages as Adult consumer but with total ingestion rate of 73 g/day.	
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	

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Table 13

Initial Values for Daily Intake Calculations – Adult Non-Tribal Fish Consumption, Single Species Diet

Scenario Timeframe: Current/Future
Medium: Fish, Single Species Diet
Receptor Population: Non-Tribal Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Value	Rationale/ Reference	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, tissue	mg/kg	TBD	--	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	IR	Ingestion rate	g/day	17.5	90th percentile (EPA 2002b) Recommended value for adults (EPA 1989)	73	95%UCL for ingestion of 75% of total fish (Adolfson 1996) Recommended value for adults (EPA 1989)	142	99th percentile (EPA 2002b) Recommended value for adults (EPA 1989)	EPC x IR x EF x ED x CF x 1/BW x 1/AT
	BW	Body weight	kg	70		70		70		
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates	365	Basis of ingestion rates	365	Basis of ingestion rates	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	30	Recommended value for residential occupancy (EPA 1997)	30	Recommended value for residential occupancy (EPA 1997)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	1.E-03	--	1.E-03	--	

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Table 14

Initial Values for Daily Intake Calculations – Child Non-Tribal Fish Consumption, Single Species Diet

Scenario Timeframe: Current/Future
Medium: Fish, Single Species Diet
Receptor Population: Non-Tribal Fisher
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Value	Rationale/ Reference	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, tissue	mg/kg	TBD	--	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	IR	Ingestion rate	g/day	7	Adjusted from the adult ingestion rate using a factor of 0.42 (ratio of adult to child ingestion from CRITFC 1994) Recommended value for children (EPA 1991)	31	Adjusted from the adult ingestion rate using a factor of 0.42 (ratio of adult to child ingestion from CRITFC 1994) Recommended value for children (EPA 1991)	60	Adjusted from the adult ingestion rate using a factor of 0.42 (ratio of adult to child ingestion from CRITFC 1994) Recommended value for children (EPA 1991)	EPC x IR x EF x ED x CF x 1/BW x 1/AT
	BW	Body weight	kg	15		15		15		
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates Recommended value for children (EPA 1991)	365	Basis of ingestion rates Recommended value for children (EPA 1991)	365	Basis of ingestion rates Recommended value for children (EPA 1991)	
	ED	Exposure duration	years	6		6		6		
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	1.E-03	--	1.E-03	--	

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Table 15

Initial Values for Daily Intake Calculations – Adult Non-Tribal Fish Consumption, Multiple Species Diet

| Scenario Timeframe: Current/Future |
| Medium: Fish, Multiple Species Diet |
| Receptor Population: Non-Tribal Fisher |
| Receptor Age: Adult |

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Value	Rationale/ Reference	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPCbb	Exposure point concentration, brown bullhead	mg/kg	TBD	--	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	EPCbc	Exposure point concentration, black crappie	mg/kg	TBD	--	TBD	--	TBD	--	[(EPCbb*IRbb)+(EPCbc*IRbc)+(EPCcp*IRcp)+
	EPCcp	Exposure point concentration, carp	mg/kg	TBD	--	TBD	--	TBD	--	(EPCsm*IRsm)] x EF x ED x CF x 1/BW x 1/AT
	EPCsm	Exposure point concentration, smallmouth bass	mg/kg	TBD	--	TBD	--	TBD	--	
	IRbb	Ingestion rate, brown bullhead	g/day	4.4	Adult Non-Tribal ingestion rate for single species divided by 4.	18.3	Adult Non-Tribal ingestion rate for single species divided by 4.	35.5	Adult Non-Tribal ingestion rate for single species divided by 4.	
	IRbc	Ingestion rate, black crappie	g/day	4.4	Adult Non-Tribal ingestion rate for single species divided by 4.	18.3	Adult Non-Tribal ingestion rate for single species divided by 4.	35.5	Adult Non-Tribal ingestion rate for single species divided by 4.	
	IRcp	Ingestion rate, carp	g/day	4.4	Adult Non-Tribal ingestion rate for single species divided by 4.	18.3	Adult Non-Tribal ingestion rate for single species divided by 4.	35.5	Adult Non-Tribal ingestion rate for single species divided by 4.	
	IRsm	Ingestion rate, smallmouth bass	g/day	4.4	Adult Non-Tribal ingestion rate for single species divided by 4.	18.3	Adult Non-Tribal ingestion rate for single species divided by 4.	35.5	Adult Non-Tribal ingestion rate for single species divided by 4.	
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates	365	Basis of ingestion rates	365	Basis of ingestion rates	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	30	Recommended value for residential occupancy (EPA 1997)	30	Recommended value for residential occupancy (EPA 1997)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	1.E-03	--	1.E-03	--	

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Table 16

Initial Values for Daily Intake Calculations – Child Non-Tribal Fish Consumption, Multiple Species Diet

Scenario Timeframe: Current/Future
Medium: Fish, Multiple Species Diet
Receptor Population: Non-Tribal Fisher
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Value	Rationale/ Reference	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPCbb	Exposure point concentration, brown bullhead	mg/kg	TBD	--	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	EPCbc	Exposure point concentration, black crappie	mg/kg	TBD	--	TBD	--	TBD	--	[(EPCbb*IRbb)+(EPCbc*IRbc)+(EPCcp*IRcp)+
	EPCcp	Exposure point concentration, carp	mg/kg	TBD	--	TBD	--	TBD	--	(EPCsm*IRsm)] x EF x ED x CF x 1/BW x 1/AT
	EPCsm	Exposure point concentration, smallmouth bass	mg/kg	TBD	--	TBD	--	TBD	--	
	IRbb	Ingestion rate, brown bullhead	g/day	1.8	Child Non-Tribal ingestion rate for single species divided by 4.	7.8	Child Non-Tribal ingestion rate for single species divided by 4.	15	Child Non-Tribal ingestion rate for single species divided by 4.	
	IRbc	Ingestion rate, black crappie	g/day	1.8	Child Non-Tribal ingestion rate for single species divided by 4.	7.8	Child Non-Tribal ingestion rate for single species divided by 4.	15	Child Non-Tribal ingestion rate for single species divided by 4.	
	IRcp	Ingestion rate, carp	g/day	1.8	Child Non-Tribal ingestion rate for single species divided by 4.	7.8	Child Non-Tribal ingestion rate for single species divided by 4.	15	Child Non-Tribal ingestion rate for single species divided by 4.	
	IRsm	Ingestion rate, smallmouth bass	g/day	1.8	Child Non-Tribal ingestion rate for single species divided by 4.	7.8	Child Non-Tribal ingestion rate for single species divided by 4.	15	Child Non-Tribal ingestion rate for single species divided by 4.	
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates	365	Basis of ingestion rates	365	Basis of ingestion rates	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	1.E-03	--	1.E-03	--	

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Table 17

Initial Values for Daily Intake Calculations – Adult Non-Tribal Crayfish Consumption

Scenario Timeframe: Current/Future

Medium: Crayfish

Receptor Population: Non-Tribal Fisher

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Value	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, crayfish	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	IR	Ingestion rate	g/day	3.3	50th percentile (EPA 2002b) Recommended value for adults (EPA 1989)	18	95th percentile (EPA 2002b) Recommended value for adults (EPA 1989)	EPC x IR x EF x ED x CF x 1/BW x 1/AT
	BW	Body weight	kg	70		70		
	EF	Exposure frequency	days/yr	365	Basis of ingestion rates	365	Basis of ingestion rates	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	30	Recommended value for residential occupancy (EPA 1997)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/g	1.E-03	--	1.E-03	--	

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Table 18

Initial Values for Daily Intake Calculations – Dockside Worker In-Water Sediment Exposures

Scenario Timeframe: Current/Future

Medium: In-Water Sediment

Receptor Population: Dockside Worker

Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	10	From interviews with workers at Terminal 4. Frequency for repair/removal of fender piles or maintenance dredging activities. Assumes a frequency of every 2-3 years over an employment duration of 25 years.	10	From interviews with workers at Terminal 4. Frequency for repair/removal of fender piles or maintenance dredging activities. Assumes a frequency of every 2-3 years over an employment duration of 9 years.	
	ED	Exposure duration	years	10		4		
	SIR	Sediment ingestion rate	mg/day	200	Recommended value for occupational exposures (EPA 2000)	50	Recommended value for occupational exposures (EPA 2000)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	3,650	Recommended value (EPA 1989)	1,460	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	10	From interviews with workers at Terminal 4. Frequency for repair/removal of fender piles or maintenance dredging activities. Assumes a frequency of every 2-3 years over an employment duration of 25 years.	10	From interviews with workers at Terminal 4. Frequency for repair/removal of fender piles or maintenance dredging activities. Assumes a frequency of every 2-3 years over an employment duration of 9 years.	
	ED	Exposure duration	years	10		4		
	SA	Skin surface area	cm2	3,300	Recommended value for adult industrial scenario (EPA 2004b)	3,300	Recommended value for adult industrial scenario (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.2	Recommended value for adult industrial scenario (EPA 2004b)	0.02	Recommended value for adult industrial scenario (EPA 2004b)	
	ABS	Absorption factor	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	3,650	Recommended value (EPA 1989)	1,460	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 19

Initial Values for Daily Intake Calculations – Transient Groundwater Seep Exposures

Scenario Timeframe: Current/Future
Medium: Groundwater Seeps
Receptor Population: Transients
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, groundwater seep at point of discharge	mg/L	TBD	--	TBD	--	Daily Intake (CDI) (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x WIR x t_{ev} x EF x ED x CF x
	t_{ev}	Event duration	hr/event	0.08	Best professional judgment. 5 minutes.	0.02	Best professional judgment. 1 minute.	1/BW x 1/AT
	EF	Exposure frequency	days/yr	26	Best professional judgment. Assumes 2 days per week during summer months (13 weeks)	26	Best professional judgment. Assumes 2 days per week during summer months (13 weeks)	
	ED	Exposure duration	years	2	Best professional judgment	1	Best professional judgment	
	WIR	Water ingestion rate	mL/hour	50	Recommended value for ingestion while swimming (EPA 1989)	50	Recommended value for ingestion while swimming (EPA 1989)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	730	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion factor	L/mL	1.E-03	--	1.E-03	--	
Dermal	DA	Absorbed dose per event	mg/cm2-event	TBD	Chemical-specific	TBD	Chemical-specific	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	DA x SA x EF x ED x 1/BW x 1/AT
	t_{ev}	Event duration	hr/event	0.08	Best professional judgment. 5 minutes.	0.02	Best professional judgment. 1 minute.	
	EF	Exposure frequency	events/yr	26	Best professional judgment. Assumes 2 days per week during summer months (13 weeks)	26	Best professional judgment. Assumes 2 days per week during summer months (13 weeks)	
	ED	Exposure duration	years	2	Best professional judgment	1	Best professional judgment	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	730	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	

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Table 20

Initial Values for Daily Intake Calculations – Adult Recreational Beach User Groundwater Seep Exposures

Scenario Timeframe: Current/Future
Medium: Groundwater Seeps
Receptor Population: Recreational Beach User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, surface water	mg/L	TBD	--	TBD	--	Daily Intake (CDI) (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x WIR x t_{ev} x EF x ED x CF x
	t_{ev}	Event duration	hr/event	0.08	Best professional judgment. 5 minutes.	0.02	Best professional judgment. 1 minute.	1/BW x 1/AT
	EF	Exposure frequency	events/yr	26	Best professional judgment. 2 days per week during summer (13 weeks)	13	Best professional judgment. 1 day per week during summer (13 weeks)	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	WIR	Water ingestion rate	mL/hour	50	Recommended value for ingestion while swimming (EPA 1989)	50	Recommended value for ingestion while swimming (EPA 1989)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion factor	L/mL	1.E-03	--	1.E-03	--	
Dermal	DA	Absorbed dose per event	mg/cm2-event	TBD	Chemical-specific	TBD	Chemical-specific	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	DA x SA x EF x ED x 1/BW x 1/AT
	t_{ev}	Event duration	hr/event	0.08	Best professional judgment. 5 minutes.	0.02	Best professional judgment. 1 minute.	
	EF	Exposure frequency	events/yr	26	Best professional judgment. 2 days per week during summer (13 weeks)	13	Best professional judgment. 1 day per week during summer (13 weeks)	
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SA	Skin surface area	cm2	5,700	Recommended value for residential adults (EPA 2004b)	5,700	Recommended value for residential adults (EPA 2004b)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	

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Table 21

Initial Values for Daily Intake Calculations – Child Recreational Beach User Groundwater Seep Exposures

Scenario Timeframe: Current/Future

Medium: Groundwater Seeps

Receptor Population: Recreational Beach User

Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, surface water	mg/L	TBD	--	TBD	--	Daily Intake (CDI) (mg/kg-day) =
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	$EPC \times WIR \times t_{ev} \times EF \times ED \times CF \times$
	t_{ev}	Event duration	hr/event	0.08	Best professional judgment. 5 minutes.	0.02	Best professional judgment. 1 minute.	$1/BW \times 1/AT$
	EF	Exposure frequency	events/yr	65	Best professional judgment. 5 days per week during summer (13 weeks)	26	Best professional judgment. 2 days per week during summer (13 weeks)	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	WIR	Water ingestion rate	mL/hour	50	Recommended value for ingestion while swimming (EPA 1989)	50	Recommended value for ingestion while swimming (EPA 1989)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	
	CF	Conversion factor	L/mL	1.E-03	--	1.E-03	--	
Dermal	DA	Absorbed dose per event	mg/cm2-event	TBD	Chemical-specific	TBD	Chemical-specific	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	15	Recommended value for children (EPA 1991)	15	Recommended value for children (EPA 1991)	$DA \times SA \times EF \times ED \times 1/BW \times 1/AT$
	t_{ev}	Event duration	hr/event	0.08	Best professional judgment. 5 minutes.	0.02	Best professional judgment. 1 minute.	
	EF	Exposure frequency	events/yr	65	Best professional judgment. 5 days per week during summer (13 weeks)	26	Best professional judgment. 2 days per week during summer (13 weeks)	
	ED	Exposure duration	years	6	Recommended value for children (EPA 1991)	6	Recommended value for children (EPA 1991)	
	SA	Skin surface area	cm2	2,800	Recommended value for residential children (EPA 2004b)	2,800	Recommended value for residential children (EPA 2004b)	
	ATc	Averaging time, cancer	days	25550	Recommended value (EPA 1989)	25550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	2,190	Recommended value (EPA 1989)	2,190	Recommended value (EPA 1989)	

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Table 22

Initial Values for Daily Intake Calculations – Adult Recreational Fisher In-Water Sediment Exposures, Long-Term

Scenario Timeframe: Current/Future
Medium: In-Water Sediment
Receptor Population: Recreational Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x SF x
	EF	Exposure frequency	days/yr	156	Required by EPA Region 10. 3 days per week for entire year.	52	Required by EPA Region 10. 1 day per week for entire year.	CF x 1/BW x 1/AT
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SF	Sediment contact frequency	percent	10%	Best professional judgment.	10%	Best professional judgment.	
	SIR	Sediment ingestion rate	mg/day	10	Best professional judgment. Assumed to be 10% of soil ingestion.	5	Best professional judgment. Assumed to be 10% of soil ingestion.	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x
	EF	Exposure frequency	days/yr	156	Required by EPA Region 10. 3 days per week for entire year.	52	Required by EPA Region 10. 1 day per week for entire year.	ED x SF x CF x 1/BW x 1/AT
	ED	Exposure duration	years	30	Recommended value for residential occupancy (EPA 1997)	9	Recommended value for residential occupancy (EPA 1997)	
	SF	Sediment contact frequency	percent	10%	Best professional judgment.	10%	Best professional judgment.	
	SA	Skin surface area	cm2	904	Average surface area for hands (EPA 2004b)	904	Average surface area for hands (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 23

Initial Values for Daily Intake Calculations – Adult Recreational Fisher In-Water Sediment Exposures, Short-Term

Scenario Timeframe: Current/Future
Medium: In-Water Sediment
Receptor Population: Recreational Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x
	EF	Exposure frequency	days/yr	12	Best professional judgment. 3 days per week for one month.	4	Best professional judgment. 1 day per week for one month.	1/BW x 1/AT
	ED	Exposure duration	years	1	Best professional judgment for short-term exposures.	1	Best professional judgment for short-term exposures.	
	SIR	Sediment ingestion rate	mg/day	10	Best professional judgment. Assumed to be 10% of soil ingestion.	5	Best professional judgment. Assumed to be 10% of soil ingestion.	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x
	EF	Exposure frequency	days/yr	12	Best professional judgment. 3 days per week for one month.	4	Best professional judgment. 1 day per week for one month.	ED x CF x 1/BW x 1/AT
	ED	Exposure duration	years	1	Best professional judgment for short-term exposures.	1	Best professional judgment for short-term exposures.	
	SA	Skin surface area	cm2	904	Average surface area for hands (EPA 2004b)	904	Average surface area for hands (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 24

Initial Values for Daily Intake Calculations – Adult Native American Consumption Fisher In-Water Sediment Exposures, Long-Term

Scenario Timeframe: Current/Future
Medium: In-Water Sediment
Receptor Population: Native American Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x SF x CF x
	EF	Exposure frequency	days/yr	260	Required by EPA Region 10. 5 days per week for entire year.	104	Required by EPA Region 10. 2 days per week for entire year. 95th percentile for time at one residence (same as recommended RME for residential adults) (EPA 1997)	1/BW x 1/AT
	ED	Exposure duration	years	70	Conventional lifetime (EPA 1989)	30		
	SF	Sediment contact frequency	percent	10%	Best professional judgment.	10%	Best professional judgment.	
	SIR	Sediment ingestion rate	mg/day	10	Best professional judgment. Assumed to be 10% of soil ingestion.	5	Best professional judgment. Assumed to be 10% of soil ingestion.	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	25,550	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x SF x
	EF	Exposure frequency	days/yr	260	Required by EPA Region 10. 5 days per week for entire year.	104	Required by EPA Region 10. 2 days per week for entire year. 95th percentile for time at one residence (same as recommended RME for residential adults) (EPA 1997)	CF x 1/BW x 1/AT
	ED	Exposure duration	years	70	Conventional lifetime (EPA 1989)	30		
	SF	Sediment contact frequency	percent	10%	Best professional judgment.	10%	Best professional judgment.	
	SA	Skin surface area	cm2	904	Average surface area for hands (EPA 2004b)	904	Average surface area for hands (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	25,550	Recommended value (EPA 1989)	10,950	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 25

Initial Values for Daily Intake Calculations – Adult Native American Consumption Fisher In-Water Sediment Exposures, Short-Term

Scenario Timeframe: Current/Future
Medium: In-Water Sediment
Receptor Population: Native American Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	$EPC \times SIR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	EF	Exposure frequency	days/yr	20	Best professional judgment. 5 days per week for one month.	8	Best professional judgment. 2 days per week for one month.	
	ED	Exposure duration	years	1	Best professional judgment for short-term exposures.	1	Best professional judgment for short-term exposures.	
	SIR	Sediment ingestion rate	mg/day	10	Best professional judgment. Assumed to be 10% of soil ingestion.	5	Best professional judgment. Assumed to be 10% of soil ingestion.	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	$EPC \times SA \times AF \times ABS \times EF \times ED \times CF \times$
	EF	Exposure frequency	days/yr	20	Best professional judgment. 5 days per week for one month.	8	Best professional judgment. 2 days per week for one month.	$1/BW \times 1/AT$
	ED	Exposure duration	years	1	Best professional judgment for short-term exposures.	1	Best professional judgment for short-term exposures.	
	SA	Skin surface area	cm2	904	Average surface area for hands (EPA 2004b)	904	Average surface area for hands (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Initial Values for Daily Intake Calculations – Adult Non-tribal High Consumption Fisher In-Water Sediment Exposures, Long-Term

| Scenario Timeframe: Current/Future |
| Medium: In-Water Sediment |
| Receptor Population: Non-tribal Fisher |
| Receptor Age: Adult |

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x SF x CF x
	EF	Exposure frequency	days/yr	104	Best professional judgment. 2 days per week for entire year. Recommended value for residential occupancy (EPA 1997)	26	Best professional judgment. 1 day every other week for entire year. Recommended value for residential occupancy (EPA 1997)	1/BW x 1/AT
	ED	Exposure duration	years	30		9		
	SF	Sediment contact frequency	percent	10%	Best professional judgment.	10%	Best professional judgment.	
	SIR	Sediment ingestion rate	mg/day	10	Best professional judgment. Assumed to be 10% of soil ingestion.	5	Best professional judgment. Assumed to be 10% of soil ingestion.	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x SF x
	EF	Exposure frequency	days/yr	104	Best professional judgment. 2 days per week for entire year. Recommended value for residential occupancy (EPA 1997)	26	Best professional judgment. 1 day every other week for entire year. Recommended value for residential occupancy (EPA 1997)	CF x 1/BW x 1/AT
	ED	Exposure duration	years	30		9		
	SF	Sediment contact frequency	percent	10%	Best professional judgment.	10%	Best professional judgment.	
	SA	Skin surface area	cm2	904	Average surface area for hands (EPA 2004b)	904	Average surface area for hands (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	10,950	Recommended value (EPA 1989)	3,285	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

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Table 27

Initial Values for Daily Intake Calculations – Adult Non-tribal High Consumption Fisher In-Water Sediment Exposures, Short-Term

Scenario Timeframe: Current/Future
Medium: In-Water Sediment
Receptor Population: Non-tribal Fisher
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SIR x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure frequency	days/yr	8	Best professional judgment. 2 days per week for one month.	2	Best professional judgment. 1 day every other week for a month.	
	ED	Exposure duration	years	1	Best professional judgment for short-term exposures.	1	Best professional judgment for short-term exposures.	
	SIR	Sediment ingestion rate	mg/day	10	Best professional judgment. Assumed to be 10% of soil ingestion.	5	Best professional judgment. Assumed to be 10% of soil ingestion.	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	
Dermal	EPC	Exposure point concentration, sediment	mg/kg	TBD	--	TBD	--	Daily Intake (mg/kg-day) =
	BW	Body weight	kg	70	Recommended value for adults (EPA 1989)	70	Recommended value for adults (EPA 1989)	EPC x SA x AF x ABS x EF x ED x CF x
	EF	Exposure frequency	days/yr	8	Best professional judgment. 2 days per week for one month.	2	Best professional judgment. 1 day every other week for a month.	1/BW x 1/AT
	ED	Exposure duration	years	1	Best professional judgment for short-term exposures.	1	Best professional judgment for short-term exposures.	
	SA	Skin surface area	cm2	904	Average surface area for hands (EPA 2004b)	904	Average surface area for hands (EPA 2004b)	
	AF	Adherence factor	mg/cm2	0.3	Value for residential adults as gardeners (EPA 2004b)	0.07	Value for residential adults as gardeners (same as recommended RME for residential adults) (EPA 2004b)	
	ABS	Absorption factor, chemical-specific	--	See Table 28	--	See Table 28	--	
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989)	25,550	Recommended value (EPA 1989)	
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989)	365	Recommended value (EPA 1989)	
	CF	Conversion Factor	kg/mg	1.E-06	--	1.E-06	--	

Table 28
Chemical-Specific Dermal Absorption Factors

Chemical	Absorption Factor (ABS)
Arsenic	0.03
Cadmium	0.001
Chlordane	0.04
2,4-Dichlorophenoxyacetic acid	0.05
DDT	0.03
TCDD and other dioxins	0.03
if soil organic content is > 10%	0.001
Lindane	0.04
Benzo(a)pyrene and other PAHs	0.13
Aroclors 1254/1242 and other PCBs	0.14
Pentachlorophenol	0.25
Semivolatile organic compounds	0.1

EPA 2004b